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Surface-Wave Phase Velocity Variations Beneath Western North American

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The 3-D image of shear-wave velocity structure is important to understand dynamic processes going on inside of the Earth. Global seismic inversions, however, cannot increase resolution scale to image detail interior of the Earth due to the present uneven distributions of seismic stations and earthquakes. Taking the advantage of the dense seismic station coverage in the Western North American, which is the best in the world and has not been fully exploited, we investigated the surface wave phase velocity variations in the period of 40 to 150 s, and are studying possible geodynamic activities under these areas.

The data are collected from the Global Seismographic Network (GSN), the Lawrence Livermore National Laboratory (LLNL) network, and USGS network. The minor arc phases G1 and R1 associated with earthquakes(M >= 5.0) are selected. Each seismogram was visually inspected in the time and spectral domains, and was compared with synthetics to ensure that the data have energy at periods 40 and 150 sec. and to guarantee the reliability of the inversion results..

Three different experiments are performed in this study. The first experiment is the traditional approach. Using PREM as a starting model, we did phase velocity inversions in different periods. Note that the present global investigation have successfully obtained the long-wavelength features, while the regional study is hard to get these variations. In the second experiment, we used Zhang and Lay's (1995) recent 3-D model as a starting model and did velocity inversion. A priori information has been involved in the third experiment. We accounted the topography variation and crystal velocity structure variation effects in the third experiment. The other novel aspect of this study is that it departs fundamentally from the constant model pararneterization approach, which has been used in most seismological tomographic studies. The large scale features are investigated first, and then, small scale features beneath the western United States are studied.

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